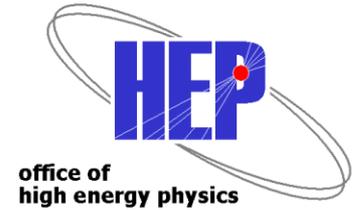




U.S. DEPARTMENT OF
ENERGY

Office of
Science



Perspectives from DOE HEP for Funding Junior Scientists

Alan L. Stone, Program Manager
Office of High Energy Physics
Office of Science

**CSS2013 • Snowmass on the Mississippi
Minneapolis, Minnesota
July 31 2013**

Outline

Introduction

DOE HEP Mission

Submitting an Effective Proposal

Peer Review Process

Funding Opportunities

HEP Comparative Review Process

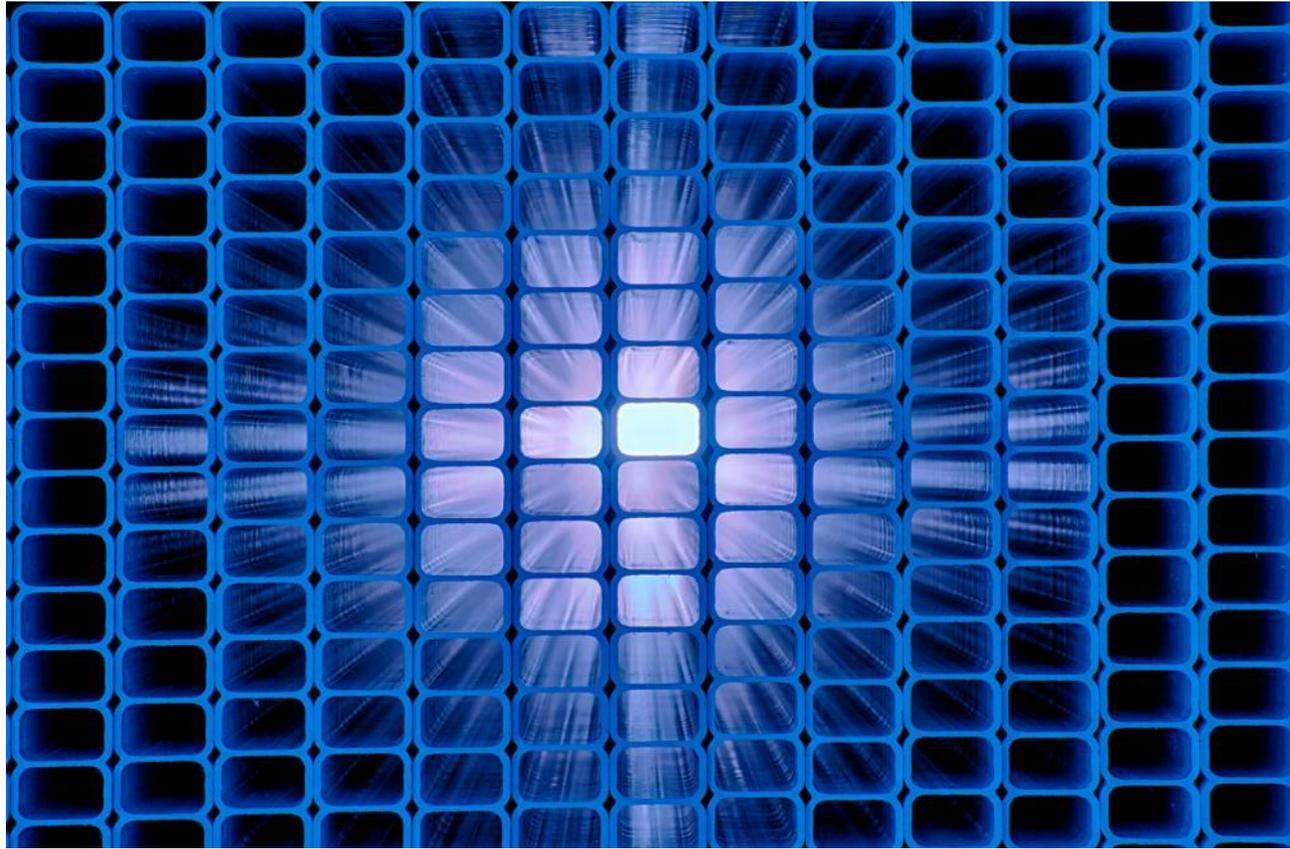
FY2013 HEP Comparative Review Statistics

Early Career Research Program

Leadership & Engagement

Conclusions

Primer on Grants and Contracts



INTRODUCTION

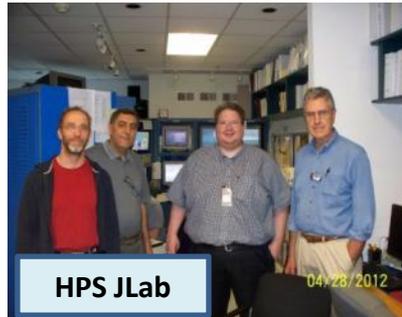
My Background

- **Academic background**
 - BU Undergrad
 - **Physics & Astronomy (NSF)**
 - LSU Grad Student
 - **JACEE (NSF), L3 (DOE)**
 - LaTech & UIC Post-docs
 - **D0 (DOE & NSF)**
 - Fermilab PPD
 - **CMS (DOE)**
- **Started position on 4 Jan 2009 as DOE Program Manager**
 - Official title is Physicist, GS-15 with the Department of Energy, Office of Science, Office of the Deputy Director for Science Programs, Office of High Energy Physics, Research and Technology Division
 - **HEP PM for Intensity Frontier research program**
- **Disclaimer**
 - *The views and opinions expressed in this presentation are those of the speaker and do not necessarily reflect the position or policy of the Department of Energy or the United States government*
- **In my brief period at DOE, I have read >1000 new, renewal and supplemental proposals**
 - Applications range from a few \$k (e.g. conference) to \$10M+ (e.g. large multi-year university group)
 - **“High Energy Physics”**
 - **“Gauge Theories, Branes, and Gravity”**
 - **“Poultry farm and fruit garden utilized by solar energy and sky water, Gives charity 20,000.00 chicken a year”**
- **Conducted 100+ university and laboratory site visits**
- **Organized and participated in dozens of reviews**
 - Early Career Research Program
 - Univ. Comparative Research
 - Lab Comparative Research
 - ARRA Infrastructure
 - Theory Graduate Fellowship
 - S&T, Operations, Projects, R&D

Alan at Work



LUX Homestake



HPS JLab

04/28/2012



Texas A&M

02/09/2010



NOVA Ash River

08/01/2011



KOTO JPARC



Tokai Japan

01/19/2010



PECASE



JPL

06/11/2012



Soudan Mine

08/02/2011



KEK

01/21/2010



T2K

04/19/2010



FNAL PAC Aspen



Kimballton Mine

04/30/2012

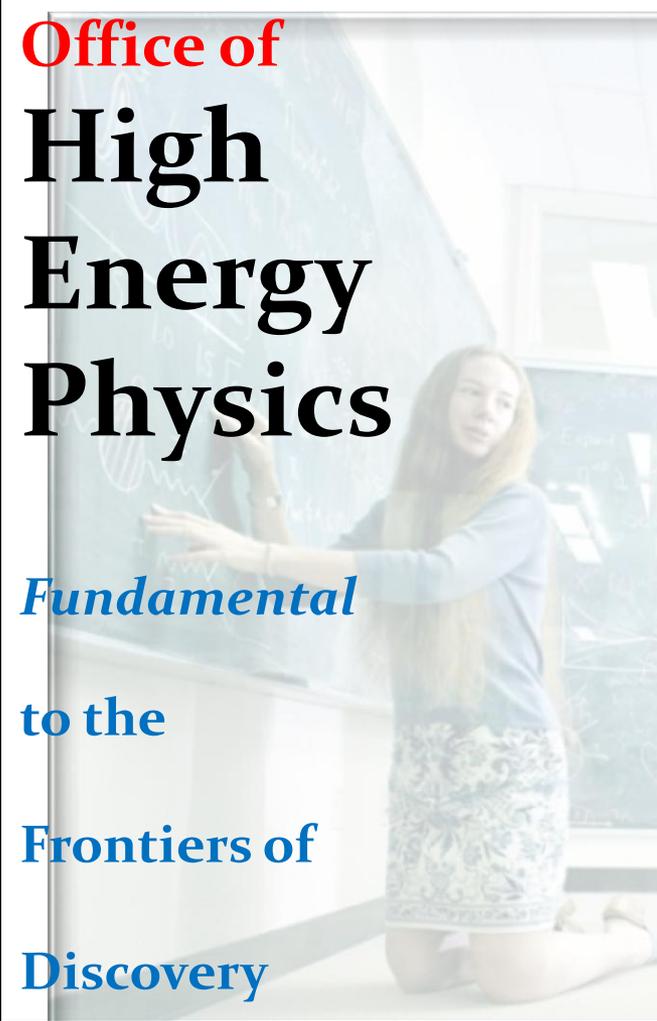


Kamioka Mine

01/23/2010



DOE HEP MISSION



Office of High Energy Physics

*Fundamental
to the
Frontiers of
Discovery*

HEP's Mission: To explore the most fundamental questions about the nature of the universe at the Cosmic, Intensity, and Energy Frontiers of scientific discovery, and to develop the tools and instrumentation that expand that research.

HEP seeks answers to Big Questions:

How does mass originate?

Why is the world matter and not anti-matter?

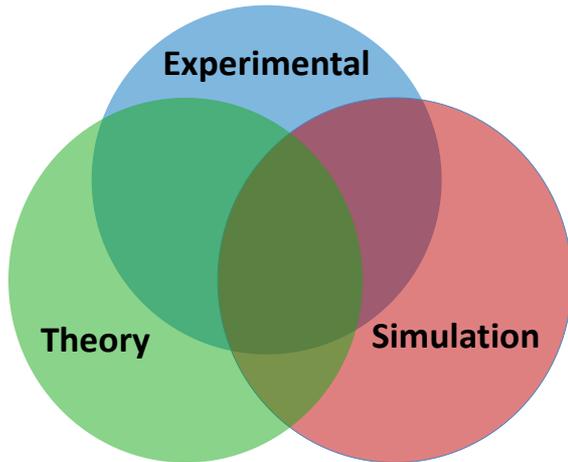
What is dark energy? Dark matter?

Do all the forces become one and on what scale?

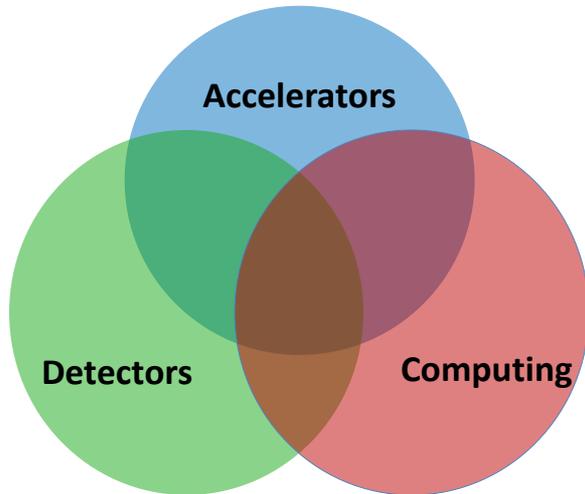
What are the origins of the Universe?

HEP offers high-impact research opportunities for small-scale collaborations at the Cosmic and Intensity Frontiers to full-blown international collaborations at the Energy Frontier. More than 20 physicists supported by the Office of High Energy Physics have received the Nobel Prize.

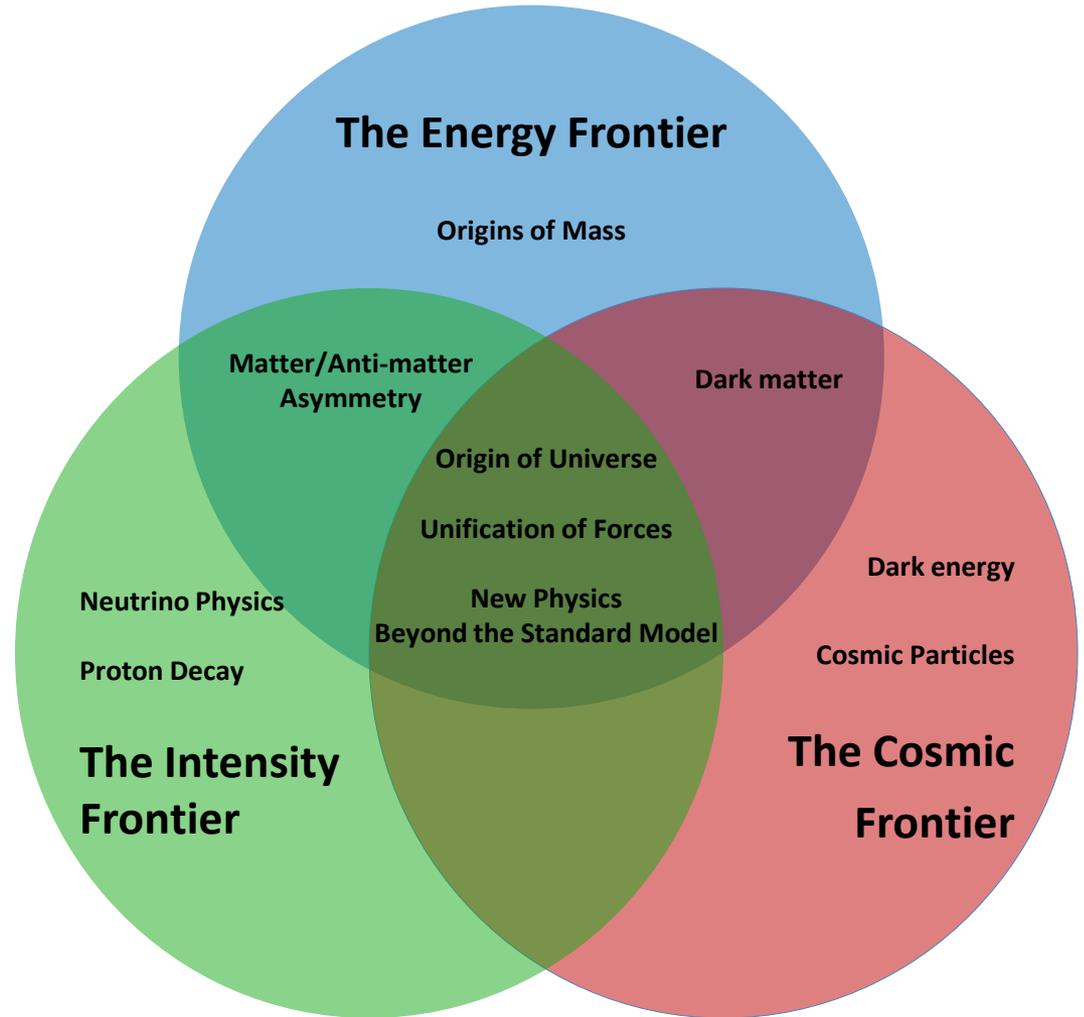
HEP Physics and Technology



Along Three Paths



Enabled by
Advanced Technologies in:



Physics Frontiers

Not Just Organizational Abstractions!

- All proposals for DOE HEP support must be written in the context of the DOE mission!
- All proposals need to fit into at least one of the circles on the previous slide!
- Clichés, but essentially true: **“The DOE supports mission-driven science; the NSF supports proposal-driven science”**.
- (But, DOE responds only to proposals, and NSF and DOE work together to support many common missions....)

HEP Research Activities Supported

- × **What's not supported on by research grants**
 - Any significant project-related activities: Engineering, Major Items of Equipment, consumables for prototyping or production
 - Non-HEP related efforts
 - Gravity (LIGO), Heavy Ion (RHIC), AMO Science, etc.

- **What Research does DOE HEP support?**
 - Research efforts (mainly scientists) on R&D, experiment design, fabrication, data-taking, analysis activities
 - Theory, simulations, phenomenology, computational studies
 - Some engineering support may be provided in Particle Detector R&D subprogram
 - Support depends on merit review process and programmatic factors
 - Consider funding other efforts that are in direct support of our experiments

- **Faculty support: Typically if we provide 2 months summer salary for the person and support for his/her group (post-docs, students – even if they are shared), we are assuming you are spending your TOTAL research time on it during the year. Therefore, you should describe what fraction of your TOTAL research time you're spending on this effort.**
 - It may be 50% time during the school year and 100% time during the summer
 - If you are working on 2 different projects, you may be spending 25% time on each during the school year and 50% time on each during the summer

- **It is important to describe your other current or pending sources of support, as well as activities in multiple subprograms in the proposal**
 - If you have other federal support (another DOE grant, or NSF or NASA, etc.) or are involved in several activities or subprograms on the HEP grant, you need to be clear what fraction of time you are spending on the different efforts
 - If you have several grants covering similar efforts (e.g. same experiment) you should be explaining how the work is different on each grant. We assume you are taking the corresponding amount of your support from the funds that support each effort, either in subprograms within the HEP grant or on the different grants.

From Deep Underground to the Tops of Mountains, HEP pushes the Frontiers of Research

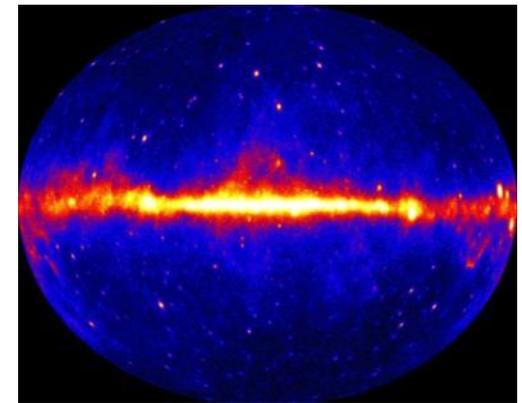
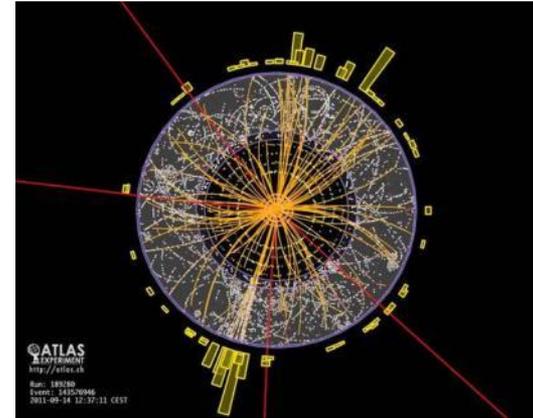
RESEARCH AT THE ENERGY FRONTIER — HEP supports research where powerful accelerators such as the LHC are used to create new particles, reveal their interactions, and investigate fundamental forces, and where experiments such as ATLAS and CMS explore these phenomena.

RESEARCH AT INTENSITY FRONTIER — Reactor and beam-based neutrino physics experiments such as Daya Bay, NOvA and LBNE may ultimately answer some of the fundamental questions of our time: why does the Universe seem to be composed of matter and not anti-matter?

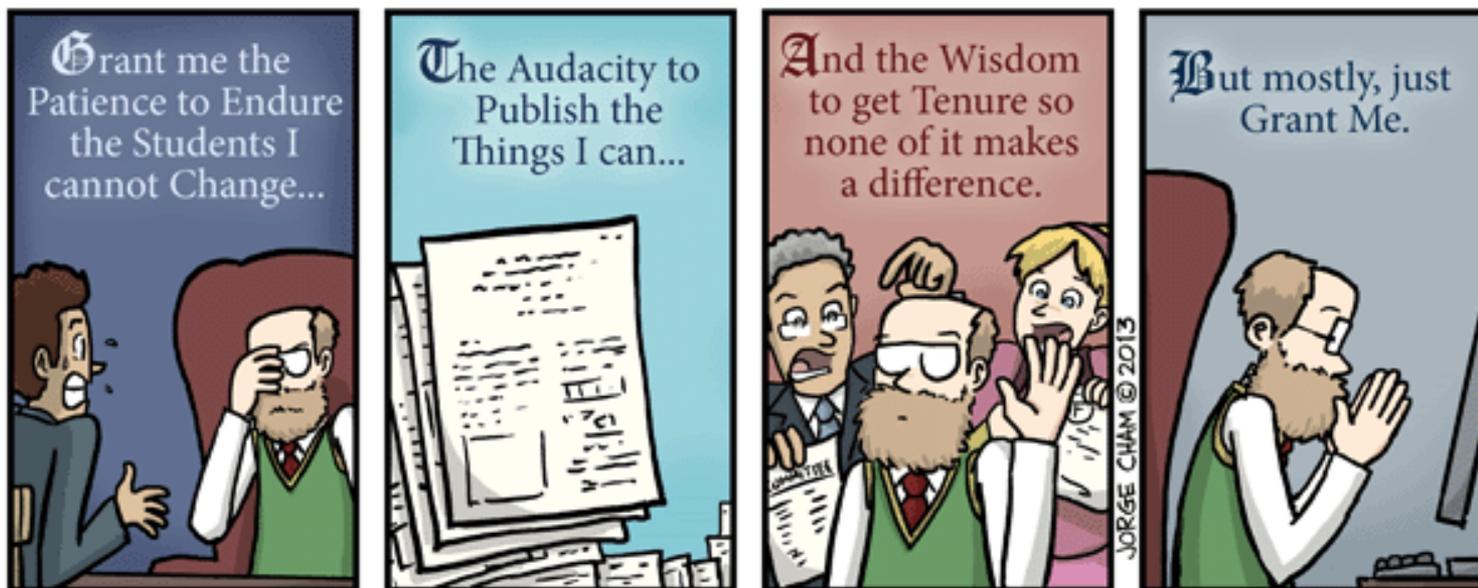
RESEARCH AT THE COSMIC FRONTIER — Through ground-based telescopes, space missions, and deep underground detectors, research at the cosmic frontier aims to explore dark energy and dark matter, which together comprise approximately 95% of the universe.

THEORY AND COMPUTATION — The interplay between theory, computation, and experiment is essential to the lifeblood of High Energy Physics. Computational sciences and resources enhance theory and enable data analysis, detector and accelerator development.

ACCELERATOR SCIENCE — Supports R&D at national labs and universities in beam physics, novel acceleration concepts, beam instrumentation and control, high gradient research, particle and RF sources, superconducting magnets and materials, and superconducting RF technology.



A Professor's Prayer



WWW.PHDCOMICS.COM

SUBMITTING AN EFFECTIVE PROPOSAL

Starting Notes

- **A faculty position does not guarantee anyone a DOE grant**
- **All proposals are subject to peer-review**
- **Review process is comparative and competitive**
- **A grant is financial assistance funded by taxpayer dollars**

Proposal Content

- **Scientific and/or Technical Merit Should Be Compelling**
 - What is the likelihood of achieving valuable results?
 - How might the results of the proposed research impact the direction, progress, and thinking in relevant scientific fields of research?
 - How does the proposed research compare with other research in its field, both in terms of scientific and/or technical merit and originality?
- **Proposed Method(s) Needs Appropriate Milestones & Deliverables**
 - How logical and feasible is the research approach of each senior investigator?
 - Does the proposed research employ innovative concepts or methods?
 - Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?
 - Does the applicant recognize significant potential problems and consider alternative strategies?
- **Competency of Research Team and Adequacy of Available Resources**
 - What are the past performance and potential of each senior investigator?
 - How well qualified is the research team to carry out the proposed research?
 - Are the research environment and facilities adequate for performing the research?
 - Does the proposed work take advantage of unique facilities and capabilities?
 - Are the senior investigators leaders within the proposed efforts and/or potential future leaders in the field?
- **Budget Justification**
 - Are the proposed resources and staffing levels adequate to carry out the proposed research?
 - Is the budget reasonable and appropriate for the scope?

Grants: What To Do

- **Do follow instructions**
 - Read the FOA thoroughly, as well as any supporting materials, e.g. FAQ
 - SC rules & procedures and HEP program requirements are regularly updated
- **Do seek out advice and support from trusted colleagues and mentors**
 - Your institution has invested a lot of time and money hiring you. They want you to succeed. Let them help you.
 - Request a review of the proposal
- **Do learn the rules, regulations, and costs of your institution**
 - Grants are awarded to the institution
- **Do follow through on reviewer feedback**
 - Give weight to the critical reviews
- **Do follow proper English grammar and composition**
 - Careless editing will annoy or confuse reviewers
 - Hire someone to proof-read your proposal
- **Do ask for what you reasonably need**
 - Standard research requests
 - Summer salary and travel
 - Other Personnel
 - Equipment, M&S, etc.
 - Realistic funding expectations for non-tenured faculty
 - Early Career Research ~\$150/yr
 - Other awards <\$100k/yr

“There’s room for bulls, there’s room for bears, but there’s no room for pigs.”

Grants: What Not To Do

- **Do Not submit a proposal late**
 - Applications received after the deadline will not be reviewed or considered for award
 - **Unacceptable justifications include the following**
 - Failure to begin submission process early enough
 - Failure to provide sufficient time to complete process
 - Failure to understand the submission process
 - Failure to understand the deadlines for submissions
 - Failure to satisfy prerequisite registrations
 - Unavailability of administrative personnel
- **Do Not brag or exaggerate**
 - Be professional and objective
 - List your accomplishments in the bio
 - Accurately and reasonably describe research plan
- **Do Not preach to the choir**
 - The narrative should be accessible to a review panel with a wide range of expertise
 - **Avoid jargon when possible**
 - Describe in clear and concise language. Tell a story.
- **Do Not submit a sloppy budget**
 - The budget sheets and justification should be prepared with the same care as the narrative
 - **Reviewers will call out any:**
 - Excessive or inappropriate requests
 - Arithmetic errors
 - Non-competitive indirect costs
- **Do Not be discouraged**
 - Competition is strong. Some very good proposals are declined due to limited resources.



PEER REVIEW PROCESS

HEP Comparative Review Process

- This Comparative Review process is very competitive and hard choices have to be made based on the reviews, as well as to fit into our limited funding availability. **This process by definition means that some of the proposals and investigators will be ranked at the top, middle & bottom.**
- It is understood that the vast majority of people applying are working hard and their efforts are in support of the HEP program. **Due to the rankings & comments by the reviewers and our constrained budgets, many people whose research activities and level of effort who are ranked lower in terms of priority and impact relative to others in the field will not be funded on the grant.**
 - This doesn't necessarily mean the person cannot continue working on the experiments; they are not being funded by the grant to do it. It could be that the person has a critical role in the program but this didn't come out in the proposal or review process. That is why it is imperative to respond to the FOA solicitation and detail each person's efforts.
- Though multiple proposals are sent to most of the mail-in reviewers, it is really the subprogram review panels that see all the proposals and will make recommendations and ranking relative to each other. In some cases, the individual mail-in reviews may give a positive assessment of the proposal and person's work, but when the panel is faced with comparing efforts, impacts and a limited budget, rather than rank the whole proposal low, they may make recommendations regarding details of the proposals
 - e.g. Person X should not be funded; do not add an additional post-doc on this effort; travel request is excessive

Review Panels

- Panelists and ad-hoc reviewers are experts representing the HEP community: labs and universities from the US and abroad.
- **The single most important factor in a funding decision is the reviewers' recommendations. Merit review rules.**
- High quality reviewers are essential for successful science. We seek people who are informed, engaged, and conscientious; and who are willing to give their honest opinion. We avoid people who mainly want to tweak HEP policy.
- Our panelists almost universally take their jobs very seriously and contribute enormously to the field.
- After you are awarded your first grant, expect invitations to be a reviewer to start coming in. Accept these invitations!
The best way to really learn about the funding process is to become a panel member.



FUNDING OPPORTUNITIES

Funding Opportunities for Junior Faculty I

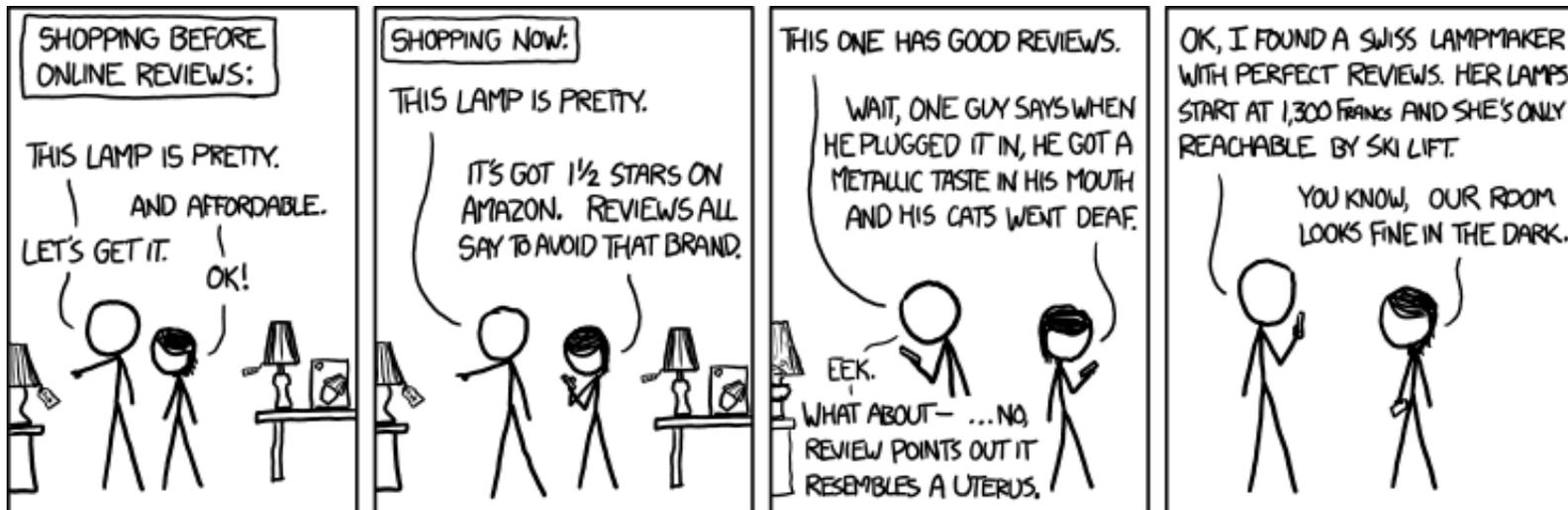
- **Q: I will be a new assistant professor, starting my first faculty position on September 1, 2013. Can I apply to the HEP comparative review FOA?**
 - **A: While you may apply, be advised that evidence of research productivity while holding your faculty position is considered highly desirable. Proposals from first year junior faculty lacking such evidence will likely be assigned a lower funding priority.**
- **Q: I am a new tenure-track faculty member at my institution. Can I apply to both the HEP comparative review FOA, as well as the Office of Science (SC) Early Career Research program?**
 - **A: Yes, you can submit the same proposal to two different Office of Science solicitations at the same time, but if both proposals are successful depending on the outcome of the merit review process in each, only one can be funded. You should indicate in any proposal that you have applied to two different FOA's.**

Funding Opportunities for Junior Faculty II

- In addition to the standard DOE HEP grant process, also keep in mind the following:
 - NSF CAREER
 - Sloan Research Fellows
 - Graduate Student Funding
 - GAANN, NSF, APS
 - Packard Fellowships in Science and Engineering
 - URA Visiting Scholars Program
 - Lab Program Funding: CMS/ATLAS Fellow, Intensity Frontier Fellow
 - University Fellowships and grant matching
 - Detector R&D funding
 - SciDAC and NERSC through DOE ASCR
 - NASA, NSF, NNSA, DHS, etc.
- For areas of research which are synergistic, costs may be burdened by more than one agency
 - Scope of work and costs still need to be delineated

Additional resources

- Office of High Energy Physics Funding Opportunities: <http://science.energy.gov/hep/funding-opportunities/>
- HEPAP March 2013 Meeting: <http://science.energy.gov/hep/hepap/meetings/20130311/>



[HTTP://XKCD.COM/1036/](http://xkcd.com/1036/)

HEP COMPARATIVE REVIEW PROCESS

Purpose: HEP Comparative Review

- In FY2012, DOE/HEP started a process of comparative grant reviews for research grants which were scheduled for renewal (+ any new proposals as desired)
 - Existing grants which did not renew in FY2012 (“continuations”) were not affected by this change in the 1st round
- Previously all HEP proposals responding to the general Office of Science (SC) call were individually peer-reviewed by independent experts.
- This change in process has been recommended by several DOE advisory committees, most recently the 2010 HEP Committee of Visitors (COV):
 - “In several of the cases that the panel read, proposal reviewers expressed negative views of the grant, but only outside of their formal responses. Coupled with the trend in the data towards very little changes in the funding levels over time, this suggests that grants are being evaluated based on the historical strength of the group rather than the current strength or productivity of the group. This is of particular concern when considering whether new investigators, new science, or high-risk projects can be competitive. Comparative reviews can be a powerful tool for addressing these issues and keeping the program in peak form.”
 - **Recommendation: Use comparative review panels on a regular basis.**
- Currently with the FY14 FOA, we are in 3rd round of annual comparative review process
- The goal of this effort is to improve the overall quality and efficacy of the HEP research program by identifying the best proposals with highest scientific impact and potential

FY14 HEP Comparative Review FOA

- **DE-FOA-0000948**
 - Issued June 14, 2013
- **Six HEP research subprograms**
 - Energy, Intensity, and Cosmic Frontiers
 - HEP Theory
 - Accelerator Science and Technology R&D
 - Particle Detector R&D
- ☑ **Letter of Intent due July 15, 2013 by 5 PM Eastern Time**
 - Strongly encouraged
- **Final Proposal (*i.e.*, Application) deadline Sept. 9, 2013 by 11:59 PM Eastern Time**

FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT



U. S. Department of Energy
Office of Science
Office of High Energy Physics

FY2014 Research Opportunities in High Energy Physics

Funding Opportunity Number: DE-FOA-0000948
Announcement Type: Initial
CFDA Number: 81.049

Issue Date:	June 14, 2013
Letter of Intent Due Date:	July 15, 2013, at 5 PM Eastern Time (A Letter of Intent is encouraged)
Application Due Date:	September 9, 2013, at 11:59 PM Eastern Time

Frequently Asked Questions (FAQ)

■ FAQ for FY14 HEP Comparative Review

- Available at:

http://science.energy.gov/~media/hep/pdf/files/pdfs/Funding%20Opportunities/FY14_Comp_Review_FAQUPDATED_JULY11_2013.pdf

- Updated: July 11, 2013

■ In addition to information provided in FOA, FAQ addresses topics on:

- Eligibility requirements
- Proposal types and scope of proposals being considered
- Guidance for new faculty members and those without current HEP grants
- Guidance for PIs with existing HEP grants
- Letter of Intent
- Proposal and Application requirements
- Budgets information, including guidance on scope of request(s)
- Information on overall scientific merit review process

FY14 Comparative Review Logistics

- **Post-FOA deadline**
 - All applications are pre-screened for compliance to FOA, includes:
 - Verification of senior investigator status
 - Compliance with proposal requirements: *e.g.*, page limits, appendix material, use of correct DOE budget and budget justification forms, ...
 - Responsive to subprogram descriptions
 - Prior to submission, all PIs should carefully follow guidelines in FOA (and **read** FAQ)
- **For review process, experts of panelists selected**
 - Each panelist assigned to review 3-5 proposals
 - Minimum 3 reviews per proposal, additional reviewers added depending on the size of a research group and scope of research activities
 - Panel convenes (in ~November 2013) to discuss *each* proposal and *each* senior investigator, provide additional reviews for proposal(s), and for comparative evaluation of proposals and senior investigators
 - Size of each subprogram's panel and length of a panel meeting depends on number of applications to review
- **Post-Review process**
 - Assess reviews at DOE OHEP on *each* proposal and *each* senior investigator in order to develop guidance and funding levels
 - In addition to reviews, solicit input from other DOE Program Managers & Grant Monitors
 - PIs given [prioritized] guidance and funding levels (~mid-January 2014) and request Revised Budgets and Justifications ⇒ route through SC and Chicago Office
- **Funded grants to begin 1st year: on or about May 1, 2014**

FY2013 HEP COMPARATIVE REVIEW STATISTICS

FY13 Submitted Proposals

- For the FY 2013 cycle, 185 proposals requesting support totaling \$335.782M in one or more of the six sub-programs were received by the September 10, 2012 deadline in response to the Funding Opportunity Announcement (FOA) *“FY 2013 Research Opportunities in High Energy Physics”* [DE-FOA-0000733].
- After pre-screening all incoming proposals for responsiveness to the subprogram descriptions and for compliance with the proposal requirements, 12 were declined before the competition.
 - There were hard page limits and other requirements. Proposals not respecting the page limits or other requirements were NOT reviewed
 - 5 proposals declined without review for this reason
 - 1 proposal was missing a research narrative
 - 4 were outside the scope of HEP
 - 2 proposals were non-responsive
 - PIs with proposals that were rejected for “technical” reasons could re-submit to general DOE/SC solicitation
- 11 proposals were withdrawn by the respective sponsoring institutions.
 - 4 were duplicate submissions
 - 6 were supplemental requests submitted to the incorrect FOA
 - 1 proposal was submitted from a federal agency which was ineligible

FY13 Reviewers & Panels

- For the FY13 HEP Comparative Review process, 162 submitted proposals reviewed, evaluated and discussed by several panels of experts who met in the 6 HEP subprograms:

Subprogram	Panel Deliberations	# of Total Proposals <small>[includes proposals containing multiple subprograms]</small>
Intensity Frontier	November 5-6, 2012	31
Theory	November 6-8, 2012	53
Particle Detector R&D	November 8-9, 2012	22
Energy Frontier	November 13-15, 2012	45
Accelerator Science and Technology R&D	November 13-14, 2012	40
Cosmic Frontier	November 14-16, 2012	28

- 30 of the proposals requested research support from 2 or more of the 6 subprograms, e.g., “umbrella” proposals
 - In such cases, the proposal was sent in its entirety to all relevant panels
 - However, the panels were asked to explicitly compare and rank only the section(s) of the proposal relevant to the sub-program they were reviewing
- Each proposal that satisfied the requirements of the solicitation was sent out for review by at least 3 experts and then subsequent comparative evaluation by the panel
 - 130 reviewers participated in the review process
 - For proposals on similar topics, reviewers were sent multiple proposals
 - 834 reviews were completed with an average 5.2 reviews per proposal

FY13 Proposals vs. FY12 Status

	New Proposals		Efforts funded in FY12				Total
	Fund	Decline	Up	Flat	Down	No-Fund	
Accelerator R&D	3	17	2	4	8	6	40
Cosmic Frontier	4	10	7	1	6	0	28
Detector R&D	6	8	2	2	2	2	22
Energy Frontier	0	4	10	2	28 ^a	1	45
Intensity Frontier	3	2	8	6	7	5	31
Theory	4	7	2	7	22	11	53
HEP Total	20	38	20	14	48	22	162

- Single proposals with multiple research thrusts are counted multiple times (1 /thrust)
- New/Fund = HEP research effort was not funded at this institution in FY12 but is funded in FY13
- New/Decline = HEP research effort was not funded at this institution in FY12 and is not funded in FY13
- Up = FY13 funding level +2% or more compared to FY12.
- Flat = FY13 funding level within $\pm 2\%$ of FY12.
- Down = FY13 funding -2% or more compared to FY12.
- No-Fund = No funding is provided in FY13. This effort was funded in FY12.

^a 11 of 28 proposals had Tevatron (CDF or D0) research activities associated with them in addition to CMS/ATLAS research activities. In general, the Tevatron efforts saw a downward reduction with respect to FY12.

Additional resources

- Office of High Energy Physics Funding Opportunities: <http://science.energy.gov/hep/funding-opportunities/>
- HEPAP March 2013 Meeting: <http://science.energy.gov/hep/hepap/meetings/20130311/> (Glen Crawford's talk)

FY13 Comparative Review Data

Jr. Faculty and Research Scientists

	Total # Jr. Faculty Reviewed (New)	# Jr. Faculty Funded (New)	Total # Res. Scientists Reviewed (New)	# Res. Scientists Funded (New)
Accelerator R&D	7 (7)	1 (1)	34 (11)	20 (0)
Cosmic Frontier	10 (8)	3 (3)	2 (2)	0 (0)
Detector R&D	3 (2)	1 (1)	10 (5)	6 (2)
Energy Frontier	16 (3)	15 (2)	28 (2)	18 (1)
Intensity Frontier	9 (5)	7 (5)	5 (0)	4 (0)
Theory	15 (7)	13 (6)	3 (0)	0 (0)
HEP Total	60 (32)	40 (18)	81 (20)	47 (3)

FY13 Proposals vs. FY12 Status

- **FY13 had many more total proposals and PIs**
 - Due to historical renewal pattern & break-up of umbrellas
 - Review logistics more complicated
 - Average proposal success rate somewhat lower
 - Average funding requests were similar in most subprograms
- **Overall funding down a few percent on average**
 - Significantly lower in Theory and Energy Frontier
- **Success rate was generally better for recurring PIs & somewhat worse for new to DOE PIs**
 - Most new PIs in Cosmic Frontier and Technology R&D
- **Success rate for new Jr. faculty about the same (~60%)**
- **Success rate for Sr. Research Scientists somewhat better**



EARLY CAREER RESEARCH PROGRAM

HEP Early Career General Observations

- Reviewers often look for **innovative** proposals
 - Usually something a bit off the beaten track that the PI can claim as their own
 - During preparation, PIs should address “Why is it critical that I carry-out this research?”
 - Should be somewhat speculative but not too risky
 - Provide unique capabilities. What does not get done?
- Re: Experimental HEP proposals that are submitted to ECRP FOA
 - Looking for a **balanced** program
 - Strong physics effort and hardware project attached to an experiment (e.g., Phase-1 upgrades for LHC)
- Many lab and some university proposals suffered from “isn’t the lab/project going to do that anyway?”
 - Some proposals were clear efforts to fund some project or R&D that HEP has not yet approved – “the camel’s nose under the tent”
 - The theory lab proposals were questioned on cost-effectiveness
- Prior to submission, applicants may want to seek guidance from senior faculty and/or staff while preparing proposals (including budget material)
- Because different reviewers weigh the criteria differently (or have their own physics biases) there is a larger spread in panel rankings

FY13 HEP Early Career Awards

Theory

- **Stefan Hoeche (SLAC) “High Precision Event Simulation for the LHC”**
- **Clifford Cheung (California Institute of Technology) “The Higgs Frontier”**
- **Andrew Tolley (Case Western Reserve University) “Exploring the Fundamental Origin of Cosmic Acceleration”**

Cosmic

- **Clarence Chang (ANL) “Exploring Fundamental Physics through New Measurements of the Cosmic Microwave Background Polarization”**
- **Adam Bolton (University of Utah) “Integrating Advanced Software and Statistical Methods for Spectroscopic Dark-Energy Surveys”**

Accelerator

- **Matthew Jewell (University of Wisconsin Eau Claire) “Mechanical Performance of HTS Superconductor for HEP Applications”**

Energy

- **Toyoko Orimoto (Northeastern University) “Search for the Higgs and Physics Beyond the Standard Model with the CMS Electromagnetic Calorimeter”**
- **Andrew Ivanov (Kansas State University) “Quest for a Top Quark Partner and Upgrade of the Pixel Detector Readout Chain at the CMS”**

Intensity

- **Jelena Maricic (University of Hawaii) “Resolving Reactor Antineutrino Anomaly with Strong Antineutrino Source”**

HEP Early Career FY10-13 Demographics (I)

M= Male
F= Female

Subprogram Awards	FY10 (M/F)	FY11 (M/F)	FY12 (M/F)	FY13 (M/F)	Total (M/F)
Energy	3 (2/1)	3 (2/1)	1 (1/0)	2 (1/1)	9 (6/3)
Intensity	2 (1/1)	1 (1/0)	3 (1/2)	1* (0/1)	7 (3/4)
Cosmic	2 (2/0)	3 (3/0)	3 (2/1)	2 (2/0)	10 (9/1)
HEP Theory	6 (6/0)	4 (3/1)	3 (3/0)	3 (3/0)	16 (15/1)
Accelerator	1 (0/1)	2 (2/0)	2 (2/0)	1 (1/0)	6 (5/1)
HEP Awards	14 (11/3)	13 (11/2)	12 (9/3)	9 (7/2)	48 (38/10)
Proposals	154 (132/22)	128 (119/19)	87 (73/14)	78 (64/14)	447 (378/69)

* Funded by DOE Office of Basic Energy Sciences (BES) as an EPSCoR [Experimental Program to Stimulate Competitive Research] award with grant monitored by DOE Office of High Energy Physics (HEP).

- **Early Career Research Program is very competitive (~10% success rate)**

HEP Early Career FY10-13 Demographics (II)

L = National Laboratory Proposal
U = University Proposal

Subprogram Awards	FY10 (L/U)	FY11 (L/U)	FY12 (L/U)	FY13 (L/U)	Total (L/U)
Energy	3 (1/2)	3 (1/2)	1 (0/1)	2 (0/2)	9 (2/7)
Intensity	2 (1/1)	1 (0/1)	3 (2/1)	1* (0/1)	7 (3/4)
Cosmic	2 (0/2)	3 (2/1)	3 (1/2)	2 (1/1)	10 (4/6)
HEP Theory	6 (1/5)	4 (0/4)	3 (0/3)	3 (1/2)	16 (2/14)
Accelerator	1 (1/0)	2 (2/0)	2 (1/1)	1 (0/1)	6 (4/2)
HEP Awards	14 (4/10)	13 (5/8)	12 (4/8)	9 (2/7)	48 (15/33)
Proposals	154 (46/108)	128 (43/85)	89 (34/55)	78 (29/49)	449 (152/297)

* Funded by DOE Office of Basic Energy Sciences (BES) as an EPSCoR [Experimental Program to Stimulate Competitive Research] award with grant monitored by DOE Office of High Energy Physics (HEP).

- **Early Career Research Program is very competitive (~10% success rate)**

Early Career: Next Round in FY14

- **FY14 FOA [DE-FOA-0000958] posted on July 23, 2013 at the Early Career website:**
 - <http://science.energy.gov/early-career/>
- **Read the FY14 FAQ, also on above web site**
 - Addresses most of the common Q&A collected over the last 4 years
- **Features of FY14**
 - Entering 5th year
 - Some population of candidates will no longer be eligible due to the “3-strikes rule”
 - Mandatory Pre-application requirement. Two pages.
 - **Deadline: September 5, 2013, 5 PM Eastern**
 - All interested PIs encouraged to register as soon as possible in DOE SC Portfolio Analysis and Management System (PAMS) for submission [link provided in EC website]
 - Full proposals due: **November 19, 2013, 5 PM Eastern**
 - Candidates will have more than 3 months to develop a plan, write a narrative, and submit an application
- **Presidential Early Career Awards for Scientists and Engineers (PECASE)**
 - PECASE-eligible candidates are selected from the pool of Early Career awardees
 - <http://science.energy.gov/about/honors-and-awards/pecase/>



LEADERSHIP & ENGAGEMENT

Snowmass Young: Redux (I)

- Review criteria for HEP Comparative Review and Early Career includes “**leader within the proposed effort and/or potential future leader in the field**”
 - Important to seek out and/or volunteer for roles and responsibilities which increase visibility and provide career advancement opportunities
 - Editorial Boards, Sub-detector systems, Physics Working Groups, Run Coordinator, etc.
 - Service work for community is also valued, e.g. co-chairing a conference committee or serving on an NSF review panel
- When asked to review, co-chair, attend, speak, etc. try **NOT** to say no!
 - You need the experience
 - Ask for feedback (if possible)
 - Respond promptly to all communication
- HEPAP: High Energy Physics Advisory Panel
 - Meets ~3 times/year
 - Open meeting in DC area
 - Sept 5-6 2013 @ NSF
 - Prof. Andy Lankford (Chair)
 - Know your reps!
- P5. Particle Physics Project Prioritization Panel
 - Nomination period ended **and selection process begins**
 - Stay informed. Follow the town halls. Learn the membership. Ask questions. Provide feedback.
- Demographics.
- HEP Organization

Snowmass Young: Redux (II)

- Timescales for HEP projects from conception to first data will only get longer in the continued pursuit of discovery science due to cost, size and complexity
- **HEP academic research track (Univ. or Lab) would benefit from developing a short-, mid- and long-term research plan**
 - **Balance research between ongoing experiment, upgrades and R&D with future experiment**
- **Starting Assistant Prof. at University will most likely continue research from most recent post-doc position**
 - **Will you be working on that same experiment in 5 years? How about 10 years?**
 - **Optimize your start-up funds by expanding your research portfolio**
- **Are you up to the challenge to get involved early and help deliver projects like LBNE and LSST to successful completion?**
 - **Don't expect people to come knocking on your door.**
 - **Sometimes it is about showing up.**
 - **Often you have to earn trust and gain credibility.**
- **This is HARD work!**
 - **You are doing cutting edge high energy particle physics**
 - **The competition for jobs at all levels in HEP is still very high.**
 - **It is not about the money.**
 - **It's about the SCIENCE!**



CONCLUSIONS
CONCLUSIONS

Closing Remarks

- Propose research that will contribute to the HEP mission, science goals and programmatic priorities
- **Read and follow all directions in the FOA**
- **Prepare and submit a well-organized proposal**
 - **Integrated and easy to comprehend sections**
 - **Well-researched and documented statement of the problem**
 - **Creative or innovative strategies for addressing the problem**
 - **Feasible goals and objectives with timeline**
 - **Budget and justification to accomplish goals**
- **Respond promptly to any and all communication from the program office**
- **Discover new physics!**

Dr. Ray Stanz: “Personally, I liked working for the university! They gave us money and facilities. We didn't have to produce anything. You've never been out of college. You don't know what it's like out there! I've worked in the private sector... they expect results!”

PRIMER ON GRANTS & CONTRACTS

Grants and Contracts

- A grant is a form of financial assistance to a designated class of recipients authorized by statute to meet recognized needs, while a contract involves the purchase of a product or service for federal use or, as stated in the Federal Grant and Cooperative Agreements Act, for the direct benefit of the government.
- The chief distinction between grants and contracts is in the nature of the “deliverable” under the funding instrument. Grantees agree to provide a good or carry out a service *on behalf of or in the stead of* the federal government, whereas contractors agree to provide a good *to* or carry out a service *for* the federal government.
- Contracts are subject to the Federal Acquisition Regulation at Title 48 of the Code of Federal Regulations. Grants are governed by “common rules” in the OMB Circulars as incorporated into grantor agency regulations.

GRANTS	CONTRACTS
<ul style="list-style-type: none"> • A flexible instrument designed to provide money to support a public purpose. 	<ul style="list-style-type: none"> • A binding agreement between a buyer and a seller to provide goods or services in return for consideration (usually monetary).
<ul style="list-style-type: none"> • Governed by the terms of the grant agreement 	<ul style="list-style-type: none"> • Governed by Federal Acquisition Regulations
<ul style="list-style-type: none"> • Flexible as to scope of work, budget, and other changes 	<ul style="list-style-type: none"> • Relatively inflexible as to scope of work, budget, and other changes
<ul style="list-style-type: none"> • Diligent efforts are used in completing research and the delivery of results 	<ul style="list-style-type: none"> • Significant emphasis placed on delivery of results, product, or performance
<ul style="list-style-type: none"> • Payment awarded in annual lump sum 	<ul style="list-style-type: none"> • Payment based on deliverables and milestones
<ul style="list-style-type: none"> • Annual reporting requirements 	<ul style="list-style-type: none"> • Frequent reporting requirements
<ul style="list-style-type: none"> • Principal Investigator has more freedom to adapt the project and less responsibility to produce results 	<ul style="list-style-type: none"> • High level of responsibility to the sponsor for the conduct of the project and production of results

Glossary

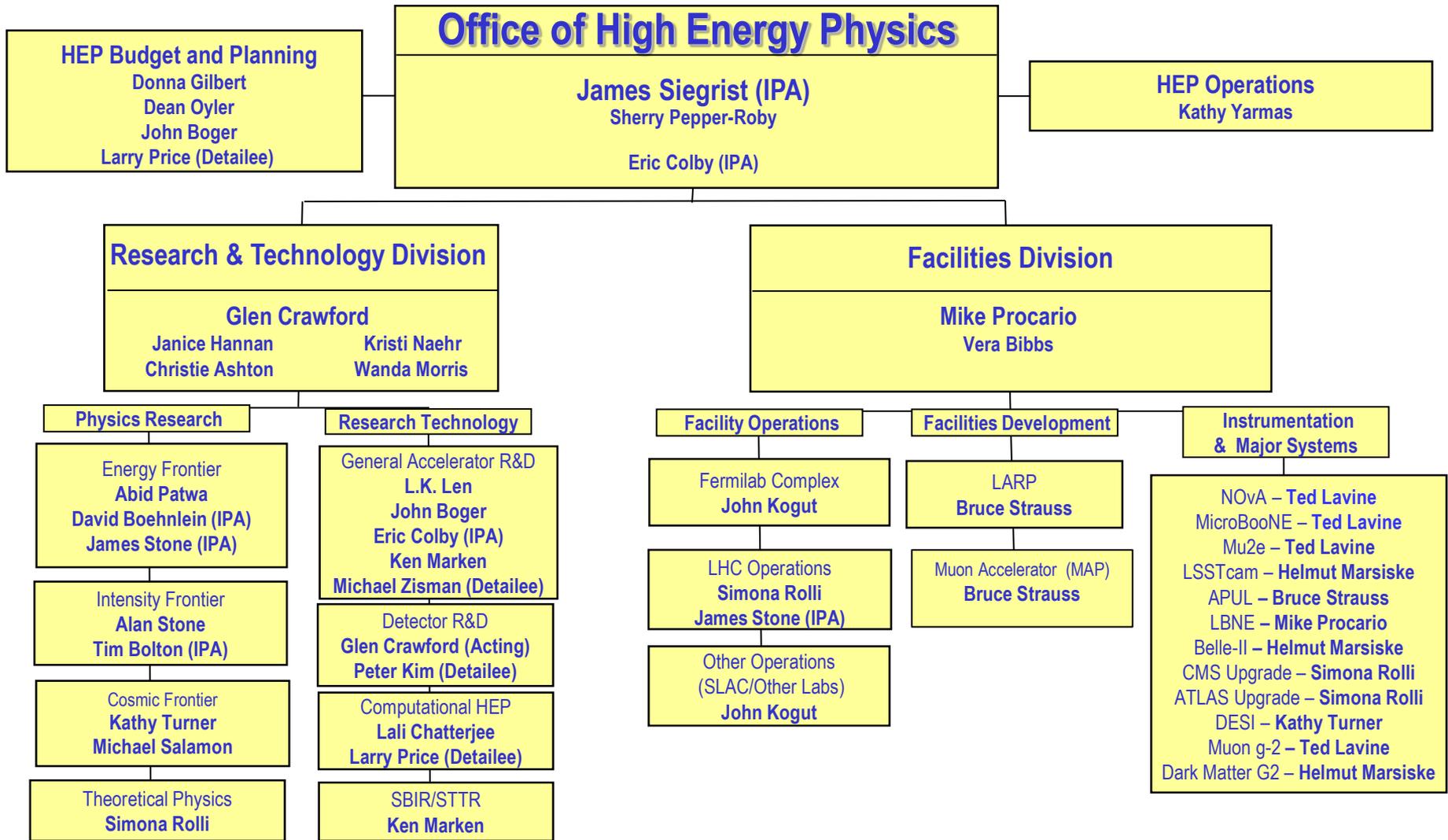
- **A funding opportunity announcement (FOA) is a notice in Grants.gov of a federal grant funding opportunity**
 - **DE-FOA-0000768. “FY 2013 Continuation of Solicitation for the Office of Science Financial Assistance Program”**
- **Grants.gov was established as a governmental resource named the E-Grants Initiative, part of the President's 2002 Fiscal Year Management Agenda to improve government services to the public**
 - **The Office of Science requires the submission of all financial assistance applications through Grants.gov**
 - **Grants.gov is the single access point for over 1000 grant programs offered by the 26 Federal grant-making agencies**
- **Portfolio Analysis and Management System (PAMS)**
- **Sponsored Research Office (SRO)**
- **Outstanding Junior Investigator (OJI)**
 - **Prior to the Early Career Research Program, HEP had supported researchers early in their careers through the OJI program from 1978 through 2009 (final year)**
 - **Later awards were typically \$60-90k/year**
- **Federally Funded Research and Development Centers (FFRDCs) conduct research for the United States Government**
 - **There are 39 recognized FFRDCs that are sponsored by the U.S. government. 16 are DOE National Laboratories.**
- **Laboratories submit Field Work Proposals (FWPs) in response to the following:**
 - **Annual DOE Field Budget Call**
 - **FOAs**
 - **Other Office of Science Program requests**
- **Laboratory Directed Research and Development (LDRD) programs are sources of internally directed funding at most DOE labs (except FNAL)**
 - **Each year LDRD invests from a few to several percent of the total lab budget in scientific research that is either too new or high-risk to be funded by existing programs.**
 - **The ability to invest in the future by funding challenging research enables each laboratory to attract and retain top researchers, and foster collaborations with other institutions and industry that promotes technology transfer to the private sector.**

Additional resources

- **Office of Science Grants & Contracts: <http://www.science.doe.gov/grants/>**
- **Grant Application Guide: <http://science.doe.gov/grants/guide.asp>**

BACK-UP

HEP Organizational Chart



Digital Data Management

Effective with all solicitations and invitations for research funding issued on or after October 1, 2013.

The DOE Office of Science Statement on Digital Data Management will require a Data Management Plan with all proposals submitted for Office of Science research funding.

See March 12, 2013 HEPAP presentation by Laura Biven:
http://science.energy.gov/~media/hep/hepap/pdf/march-2013/2013_Spring_HEPAPBriefing_v3_NoBackup_LBiven.pdf

More information will also be available in the FOAs, via the DOE Office of Science website, and on the High Energy Physics webpage.

Note: Proposals submitted to the FY14 HEP Comparative Review FOA [DE-FOA-0000948] or to the FY14 Early Career Research Program FOA [DE-FOA-0000958] that have already been posted will not require Data Management Plans.

Award Search

- In 2011, the Office of Science deployed on its website an award search that provides access to active award information. The award search is found under “Funding Opportunities” dropdown on the main website, and from the programmatic sites.
 - <http://science.energy.gov/hep/funding-opportunities/award-search/>
- Phase II of the award search was deployed in 2012, and implements an advanced keyword search, has new sorting features, and adds a few data fields to the Excel export.
- **Features:**
 - **New awards will NOT show up in the search until they are issued and signed by the Contract Officer (CO) in DOE Chicago.**
 - **Renewals which have been issued but not awarded will reflect the prior funding period/amount until the newest renewal is issued and signed by the CO.**
 - **Awards under no-cost extensions will show up with dollar values of zero.**
 - **Awards or award modifications are entered into the database by the grants analysts about once a week.**

ADDITIONAL MATERIAL ON HEP COMPARATIVE REVIEW PROCESS

Programmatic Considerations

- **Generally very useful to have head-to-head reviews of PIs working in similar areas, particularly for large grants**
- **Lots of discussion of relative strengths and weaknesses of individual proposals and PIs**
- **Many factors weigh into final funding decisions**
 - **Compelling research proposal for next ~3 years**
 - Interesting? Novel? Significant? Plausibly achievable?**
 - Incremental? Implausibly ambitious? Poorly presented?**
 - **Significant recent contributions in last 3-4 years**
 - **Synergy and collaboration within group (as appropriate)**
 - **Contributions to the research infrastructure of experiments**
 - **Alignment with programmatic priorities**
- **Supportive of excellent people, including excellent *new* people, even when **times are tough!****

Comparative Review Criteria

(In descending order of importance)

- **1. Scientific and/or Technical Merit of the Project**
For e.g., what is the likelihood of achieving valuable results? How might the results of the proposed research impact the direction, progress, and thinking in relevant scientific fields of research? How does the proposed research compare with other research in its field, both in terms of scientific and/or technical merit and originality? Please comment individually on each senior investigator.
- **2. Appropriateness of the Proposed Method or Approach**
For e.g., how logical and feasible is the research approach of each senior investigator? Does the proposed research employ innovative concepts or methods? Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions? Does the applicant recognize significant potential problems and consider alternative strategies?
- **3. Competency of Research Team and Adequacy of Available Resources**
For e.g., what are the past performance and potential of each senior investigator? How well qualified is the research team to carry out the proposed research? Are the research environment and facilities adequate for performing the research? Does the proposed work take advantage of unique facilities and capabilities?
- **4. Reasonableness and Appropriateness of the Proposed Budget**
Are the proposed resources and staffing levels adequate to carry out the proposed research? Is the budget reasonable and appropriate for the scope?
- **5. Relevance to the mission of the Office of High Energy Physics (HEP) program**
How does the proposed research of each senior investigator contribute to the mission, science goals and programmatic priorities of the subprogram in which the application is being evaluated? Is it consistent with HEP's overall mission and priorities? How likely is it to impact the mission or direction of the HEP program?
- **6. General Comments and Overall Impression**
Include any comments you may wish to make on the overall strengths and weaknesses of the proposal, especially as compared to other research efforts in this area. If there are significant or unique elements of the overall proposal, including institutional setting and resources, synergies with other relevant subprograms, or other broader considerations not noted above please include them here.

Scoring by Panelists

Table A: Scoring system definition.

Qualifier	Poor	Fair	Good	Very Good	Excellent	Outstanding
Score	1	2	3	4	5	6

- **Using the grading system in Table A above, please provide scores for the overall proposal in the respective HEP subprogram area.**
 - Please provide scores from 1 [Poor] to 6 [Outstanding] for each of the five criteria in Sections 1-5 in Table B below. Your scores should be supported by your answers to questions 1-5.

Table B: Overall Score in the **Subprogram.**

Criterion	Overall Score [1 to 6]
1) Scientific Merit	
2) Appropriateness	
3) Competency	
4) Budget	
5) Mission Relevance	

Rating by Panelists

Table C: In comparison with similar **Subprogram** research efforts, please indicate whether you judge this program to lie in the bottom, 2nd, 3rd, 4th, or top quintile. Enter an “X” in the appropriate box.

Bottom 1-20%	Bottom 21%-40%	Mid 41%-60%	Top 61%-80%	Top 81%-100%

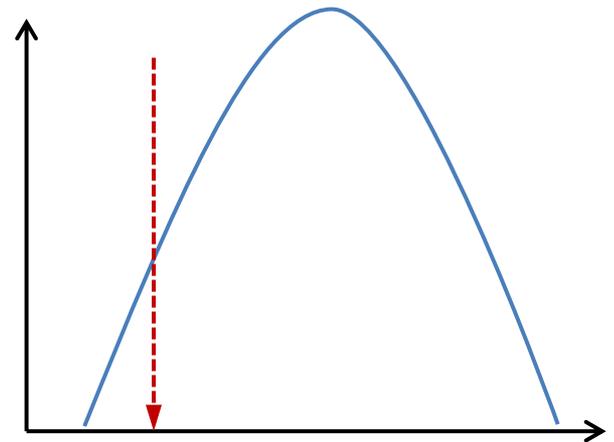
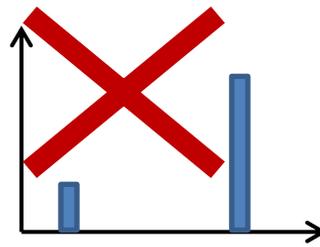
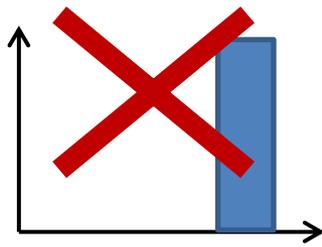
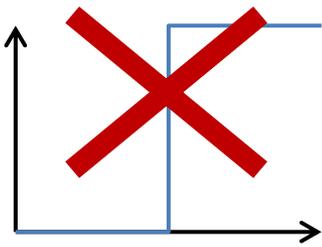
- **Next, for each senior investigator listed in Table D, provide scores for the following [two] criteria:**
 - (1) the merit and potential impact of the proposed work
 - (2a) the competency of the investigator and the likelihood of success. Use grading system defined in Table A.
 - (2b) compared to other senior investigators working in the same area at this and other institutions, how would you rank this investigator overall in terms of quintiles?
 - Please put an “X” in the appropriate box in Table D. Your ratings below should be supported by your answers to questions 1 to 5 and the scores in Table D itself.

Table D: Individual **Subprogram** senior investigator scores.

Senior Investigator	Scientific merit and potential impact of proposed work [enter 1 to 6]	Competency of senior investigator’s team and likelihood of success [enter 1 to 6]	Compared to other senior investigators working in the same area, how would you rank this senior investigator overall? Please enter one “X” per senior investigator in one of the columns below.				
			Bottom 1%-20%	Bottom 21%-40%	Mid 41%-60%	Top 61%-80%	Top 81%-100%
Senior Investigator #1							
Senior Investigator #2							
Senior Investigator #3							

Comparative Evaluation

- **DOE Program Managers will need to determine:**
 - The threshold for funding each proposal
 - The level of support for each funded proposal
- **A “comparative” evaluation:**
 - Reviewer scores and rankings of the proposals and senior investigators provide essential (additional) input to DOE’s process of optimizing resource allocations for the University research program
 - **Not everyone can be “Above Average”**



FY13 Declined Proposals

- Based on the reviewers' assessments, the comparison and ranking of the proposals by the panel(s) within the subprogram(s), evaluations of the needs of the HEP research program by the respective program managers, the potential impact of the proposed work, the proposals' responsiveness to the FY13 HEP Comparative Review FOA, and the budgetary constraints, **61 proposals were recommended for declination.**
 - 12 proposals were seeking new scope of research support (currently funded by DOE HEP)
 - 12 proposals were requesting support to extend currently funded research (aka "renewal")
 - 37 proposals were from senior investigators not supported by a DOE HEP grant in FY12
 - Including 7 proposals from Small Business applicants
 - 15 proposals came from senior investigators who were not successful in the FY12 Comparative Review

FY13 Review Data by Proposal

	Energy	Intensity	Cosmic	Theory	Acc. R&D	Det. R&D	HEP Total
Received	46	33	33	56	44	30	185
Declined/Withdrawn Without Review	1	2	5	3	4	8	23
Reviewed	45 (1)	31 (5)	28 (14)	53 (11)	40 (21)	22 (14)	162 (58)
Funded	40 ^(a) (0)	24 (3)	18 (4)	35 (4)	17 ^(b) (3)	12 (6)	101 (20)
Declined	5 (1)	7 (2)	10 (10)	18 (7)	23 (17)	10 (8)	61 (38)
“Success Rate” (%) (Previous/New)	89	77	64	66	43	55	62 (78/34)

NOTES:

- Single proposals with multiple research subprograms are counted multiple times (1 /subprogram)
- () indicates number of proposals from research groups that did not receive DOE HEP funding in FY12.
- “Success Rate” is = # Funded/ # Reviewed.
- Most proposals are not fully funded at requested level.
- About 68% of the proposals reviewed were from research groups that received DOE HEP funding in FY12.
- Overall success rate of reviewed proposals for previously (newly) funded groups was 78% (34%).

^(a) 3 of 40 Energy funded proposals were provided term support (<1 year) for graduate students and post-docs.

^(b) 5 of 17 Accelerator R&D funded proposals were provided term support (<1 year).

FY13 Review Data by Senior Investigator

	Energy	Intensity	Cosmic	Theory	Acc. R&D	Det. R&D	HEP Total
Received	127	56	61	155	57	47	504
Declined/Withdrawn Without Review	1	2	8	9	4	18	42
Reviewed	126 (7)	54 (8)	54 (30)	146 (24)	53 (25)	29 (19)	462 (113)
Funded	112 (3)	43 (6)	27 (7)	115 (11)	24 (4)	19 (9)	338 (40)
Declined	14 (4)	11 (2)	26 (23)	31 (13)	29 (21)	13 (10)	124 (73)
“Success Rate” (%) (Previous/New)	89	80	51	79	45	53	73 (85/35)

NOTES:

- () indicates number of senior investigators that did not receive DOE HEP funding in FY12.
- “Success Rate” is = # Funded/ # Reviewed.
- Overall success rate for previously (newly) funded DOE HEP PIs was 85% (35%).
- Most (but not all) PIs who are funded, are funded at requested effort level.

More on Research Scientists (RS)

- Efforts of *all* RS that have support requested in a proposal are evaluated by the panel
- See also Q&A-40 of FAQ...
 - Requests to support RS dedicated full-time (and long-term) to operational and/or project activities for an experiment will not be supported by respective frontier research areas
 - If RS conducting physics research-related activities, requests [scaled to % of time on such efforts] can be included
 - Any final support will be based on the merit review process
- Common reviewer comments that result in unfavorable merit reviews:
 - ‘RS conducting scope of work typically commensurate at the postdoctoral-level...’
 - ‘RS involved in long-term operation/project activities with minimum physics research efforts...’
 - Such efforts may review well in a DOE review of the operation/project program but not as well in a review of the experimental research program
- What is physics research-related activities?
 - Object reconstruction/algorithm development, performance studies, data taking and analysis, and mentorship of students & postdocs in these areas
 - Scientific activities in support of detector/hardware design and development
- From the research program, cases become an issue when operations/projects become the *dominant* activity long-term
 - A well-balanced portfolio that includes physics research-related activities is encouraged

ADDITIONAL MATERIAL ON HEP INTENSITY FRONTIER

HEP Intensity Frontier Experiments

Experiment	Location	Status	# Institutions	#Collaborators	#US Inst.	#US Coll.
Belle II	KEK, Tsukuba, Japan	Physics run 2016	70	508+	10 Univ, 1 Lab	55
BES III	IHEP, Beijing, Ching	Running	50	363	6 Univ	26
CAPTAIN	Los Alamos, NM, USA	R&D; Neutron run 2015	6+	20+	5 Univ, 1 Lab	20+
Daya Bay	Dapeng Peninsula, China	Running	38	229	13 Univ, 2 Lab	76
Heavy Photon Search	Jefferson Lab, Newport News, VA, USA	Physics run 2015	17	63+	8 Univ, 2 Lab	47
KOTO	J-PARC, Tokai , Japan	Running	16	66	3 Univ	12
LArIAT	Fermilab, Batavia, IL	R&D; Phase I 2013	18	45+	11 Univ, 3 Lab	38
LBNE	Fermilab, Batavia, IL & Homestake Mine, SD, USA	CD1 Dec 2012; First data 2023	65	366+	48 Univ, 6 Lab	336
MicroBooNE	Fermilab, Batavia, IL, USA	Physics run 2014	19	108	15 Univ, 2 Lab	101
MINERvA	Fermilab, Batavia, IL, USA	Med. Energy Run 2013	21	65	13 Univ, 1 Lab	48
MINOS+	Fermilab, Batavia, IL & Soudain Mine, MN, USA	NuMI start-up 2013	27	75	15 Univ, 3 Lab	53
Mu2e	Fermilab, Batavia, IL, USA	First data 2019	26	139+	15 Univ, 4 Lab	106
Muon g-2	Fermilab, Batavia, IL, USA	First data 2016	27	100+	13 Univ, 3 Lab, 1 SBIR	75+
NOvA	Fermilab, Batavia, IL & Ash River, MN, USA	Physics run 2014	34	144	18 Univ, 2 Lab	114
ORKA	Fermilab, Batavia, IL, USA	R&D; CD0 2017+	17	48+	6 Univ, 2 Lab	26
Super-K	Mozumi Mine, Gifu, Japan	Running	35	121	7 Univ	29
T2K	J-PARC, Tokai & Mozumi Mine, Gifu, Japan	Running; Linac upgrade 2014	56	500+	10 Univ	70
US-NA61	CERN, Geneva, Switzerland	Target runs 2014-15	27 (NA61/SHINE)	144 (NA61/SHINE)	4 Univ, 1 Lab	15
US Short-Baseline Reactor	Site(s) TBD	R&D; First data 2016	11	28+	6 Univ, 5 Lab	28

FOA: Intensity Frontier Research Program

From the HEP FY14 Funding Opportunity Announcement

- This subprogram seeks to support precision studies that are sensitive to new physics at very high energy scales, beyond what can be directly probed with energy frontier colliders. Often these studies involve observing rare processes that require intense particle beams. In addition, recent advances in neutrino physics have opened the first window beyond the Standard Model of particle physics, perhaps signaling significant new properties of neutrinos that will have wide ranging impact in particle physics and cosmology.
- This subprogram includes studies of high intensity electron-positron collisions; studies of the properties of neutrinos produced by accelerators, nuclear reactors, and certain rare nuclear decays; and studies of rare processes using high intensity beams on fixed targets. In addition, this subprogram includes searches for proton decay.
- This subprogram also provides graduate and postdoctoral research training for the next generation of scientists, and equipment and computational support for physics research activities.

HEP Intensity Frontier Portfolio

- **Over 20 Research Thrusts**
 - **Neutrinos**: MINOS(+), MINERvA, MiniBooNE, NOvA, MicroBooNE, LBNE at FNAL; T2K at J-PARC; SuperK at Kamioka; Daya Bay Reactor in China; Double Chooz Reactor in France
 - **Rare Decays**: KOTO at J-PARC; Mu2e, Muon g-2 at FNAL; MEG at PSI; EXO-200 at WIPP
 - **Electrons**: BaBar at SLAC; Belle/Belle-II at KEK; BES-III at IHEP
 - **R&D Activities**: ORKA, LAr1AT at FNAL; CAPTAIN at LANL; NA61/SHINE at CERN; HPS, DarkLight at JLAB; nEXO; nuSTORM; Short Baseline Reactor
- **FY 2012 Summary**
 - Supported research at 56 Universities, 9 DOE Labs
 - **Approximately 435 FTEs**
 - **35% of research activities are off-shore**